The Driller

JULY 1959

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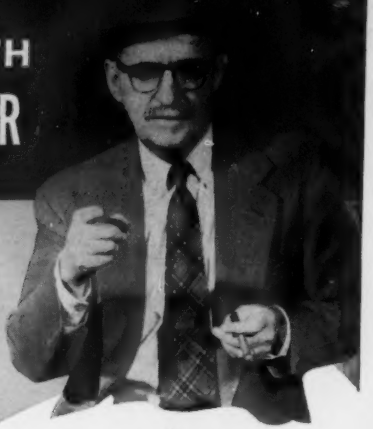

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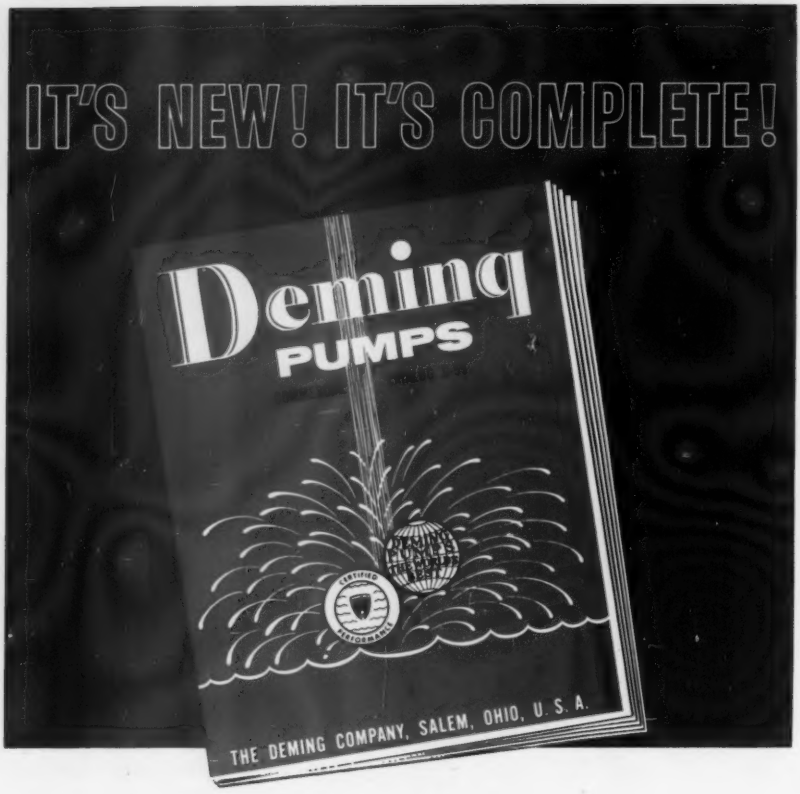

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The Driller

South Milwaukee, Wisconsin

Vol. 33 No. 7

July 1959

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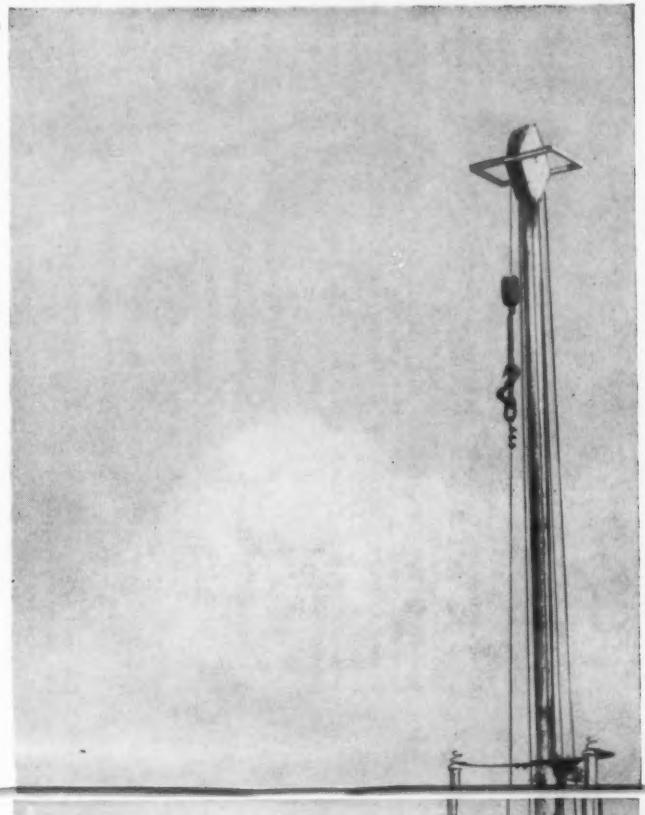

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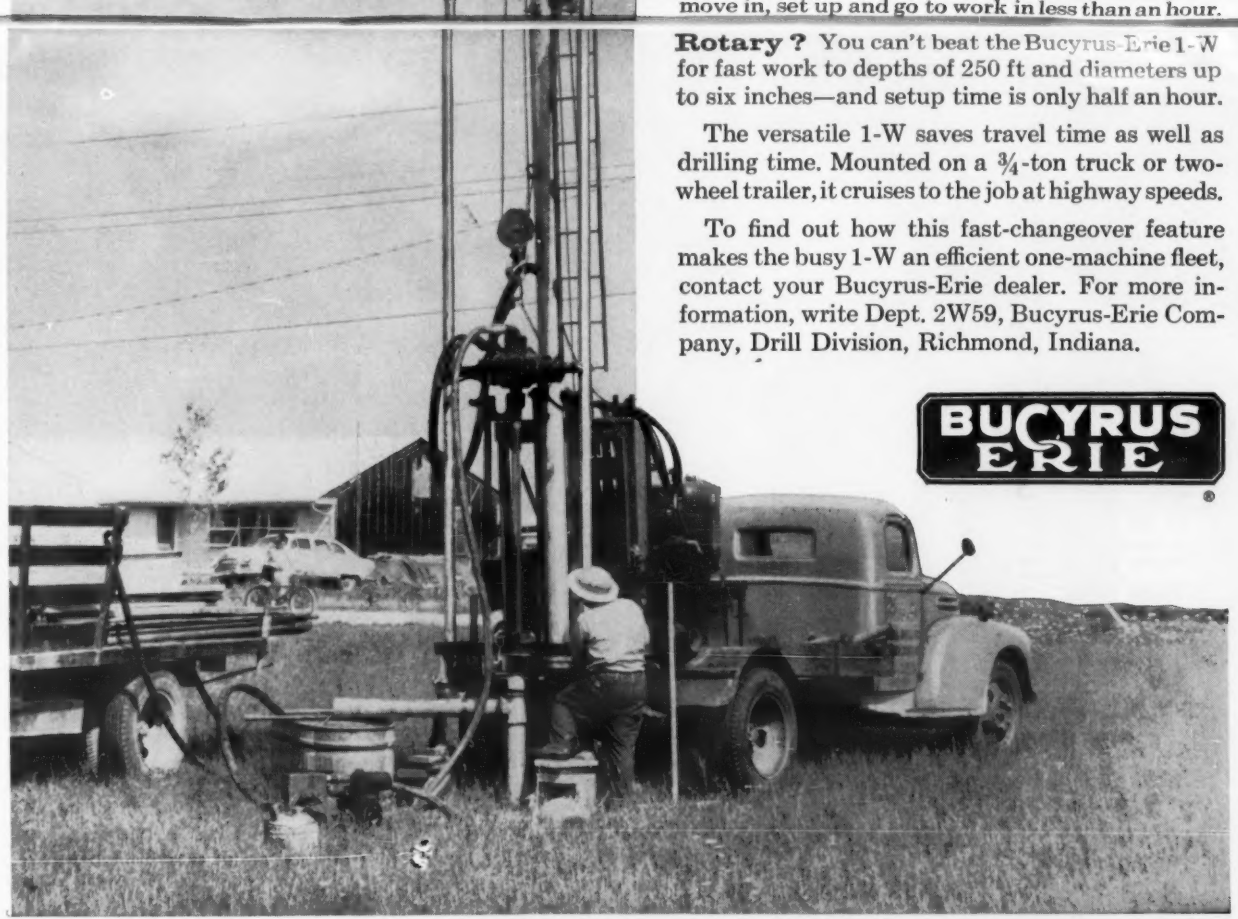

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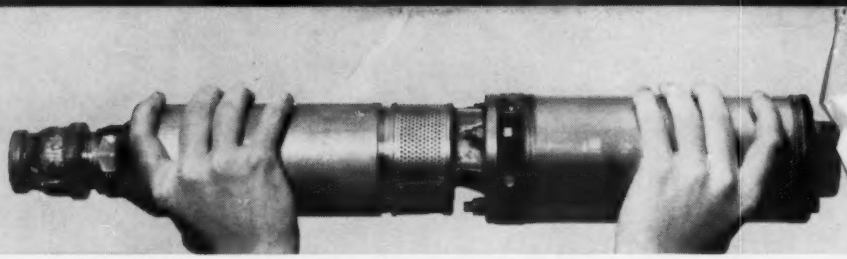

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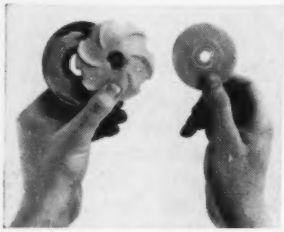

How can a pump with so many *new ideas* sell for so little?

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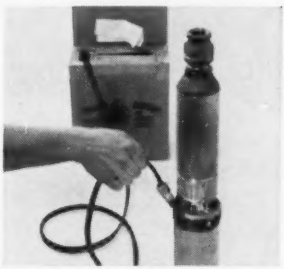
2. Its light weight is easier on the motor during starts.
3. Its light weight is easier *on you* during installation.
4. It permanently maintains its size and shape; water absorption is low.
5. It can be accurately molded for precision-fitting parts.

6. Minerals and algae deposits can't adhere to it. Water tastes better!
7. Because of its high strength and resistance to abrasion, BYRITE wears and wears to lengthen life.

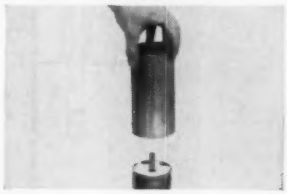
The unique shaft you see here also contributes to the long service life of the Silent-Flow. Because it has six sides—called a "Hex-A-Drive" shaft—it provides a *positive* drive with *minimum* wear. Impeller keys—the weakest points inside most subs—are eliminated.

In fact, in test after test, this shaft—plus durable BYRITE parts—outlasted all others in wear and tear.



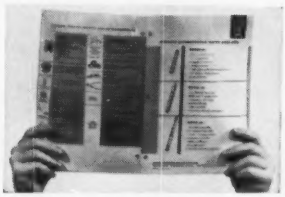
For instance, the Goulds Silent-Flow has been run for 170,000 cycles without the "Hex-A-Drive" shaft and the BYRITE parts showing a sign of wear, while subs it was tested against quit at 100,000 cycles.

This new drop-cable design—three leads in a *single* cable jacket—simplifies installation of the Silent-



Flow. You just plug it in—no splice to make, no possibility of making a wrong connection at the pump end. All controls remain at the surface for accessibility.

Should you ever have to look inside this pump *after* it has been in the well, it's easy! Pump pressure is contained by this stainless bowl construction, without gaskets, rather than by the casing itself. This permits plenty of clearance between casing and bowls, so disassembly is fast and easy.



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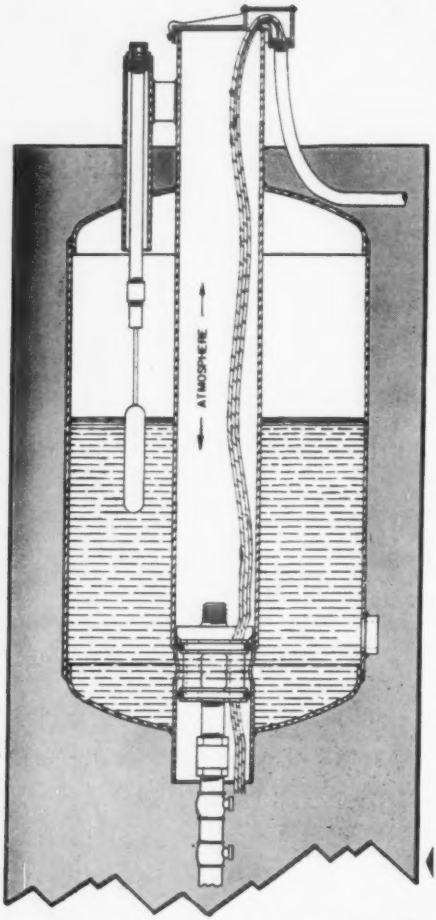

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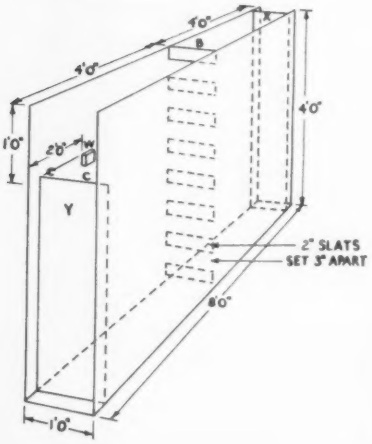
Measurement of

SEVERAL means are available for measuring the discharge flow from a pump. All of them are based on the laws of *hydrodynamics,* that branch of hydraulics which treats with water in motion. The most accurate method for determining quantity is by measuring the volume and weight of water in a container. Barrels or similar cylindrical vessels are most frequently used to measure volume. Any cylinder may be measured to determine its capacity in gallons by multiplying the square of the diameter in inches by the given depth in inches and multiplying the figure obtained by 0.0034. Thus a tank 32 inches in diameter and 48 inches high will hold 167.12 gallons.

Many times drillers will use an ordinary barrel of 50 gallons capacity to catch the discharge from a pump, timing the flow with a watch. They may fill the barrel in 20 seconds and report that they were pumping at the rate of 150 gpm, but chances are they are from 10 to 30% in error because of the turbulence of the discharge; the timing may not be exactly correct and the exact 50 gallons may not be deposited in the barrel.

Laboratories may be equipped with devices which will determine a discharge flow accurately, but the average well driller or pump salesman has to make tests under all sorts of conditions, using methods which require less equipment and time.

Fig. 1. Standard rectangular weir



Weir Method Described

One of the most common of these is the weir method. The term "weir" stems from the Anglo-Saxon *wer* — a dam or obstruction built across a stream to create a storage basin or to direct water for other purposes. From about 1848 when James B. Francis started his experiments on weirs 10 feet long and devised the Francis formula for computing flows over weirs, many formulas have been developed. All may be traced back to the basic Francis formula,

$$Q = 2/3 \sqrt{2}\ gl H^{3/2}$$

We shall not go into a full explanation of formulas and their use—such information can be obtained from any of a number of texts on hydraulics —but we will offer suggestions for

This article is based on material taken from "Water Well Drilling with Cable Tools" — by Raymond W. Gordon. Copies of the book are available at a cost of $2.50 from *The Driller,* So. Milwaukee, Wis.

Pump Discharge Flow

building various types of weirs and include tables which will enable every driller to test properly for capacity any well he has drilled. We will also show methods which can be used to determine drawdown.

Three main methods of determining discharge volumes, simple to use and understand when tables are provided, give fairly accurate results when proper procedures are followed. These are the (1) standard rectangular weir, (2) triangular weir, and (3) circular orifice weir. Preference and availability of materials seem to determine which method will be used.

1. Standard Rectangular Weir, Without End Contractions. Any handyman can construct a portable weir of this type which can be used for measuring the flow of an average well. A watertight box constructed of ¾-in. plywood sides 4 x 8 feet, with fitted ends, partition and bottom, will serve many years. It may be put together in accordance with the accompanying sketch (Fig. 1). Cover end of compartment Y at C with metal strip. Nail block W on inside of box with top exactly level with top of metal strip C.

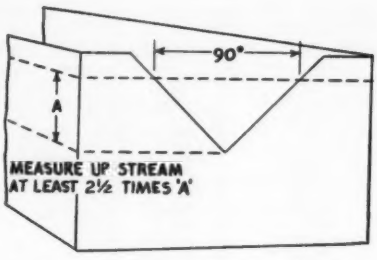


Fig. 2. Triangular weir with 90° notch

Partition B may be perforated or constructed of three or four pieces of wood with openings between, or built in any other way to channel the flow of water into compartment Y. Compartment X should be filled with branches of trees to aid further in preventing turbulence in compartment Y. Water is discharged from the pump into compartment X, pass-

TABLE 1
WATER FLOW IN GALLONS PER MINUTE

	For Heads on Weir in Inches			
Head	**0**	**¼**	**½**	**¾**
1	36	50	66	83
2	102	121	142	164
3	187	211	235	261
4	288	315	343	372
5	402	432	464	496
6	528	562	596	631
7	666	702	739	776
8	814	852	891	931

Courtesy Edw. E. Johnson, Inc.

TABLE 2
DISCHARGE OF WATER OVER 90° TRIANGULAR WEIRS

Head A (In Inches)	GPM	Head A (In Inches)	GPM	Head A (In Inches)	GPM
1½	6.6	3¾	64	8	416
1¾	9.8	4	75	8½	485
2	13.6	4½	100	9	556
2¼	18.0	5	130	9½	635
2½	23.5	5½	165	10	721
2¾	30.0	6	204	10½	813
3	37.0	6½	249	11	913
3¼	45.0	7	299	11½	1020
3½	54.0	7½	355	12	1131

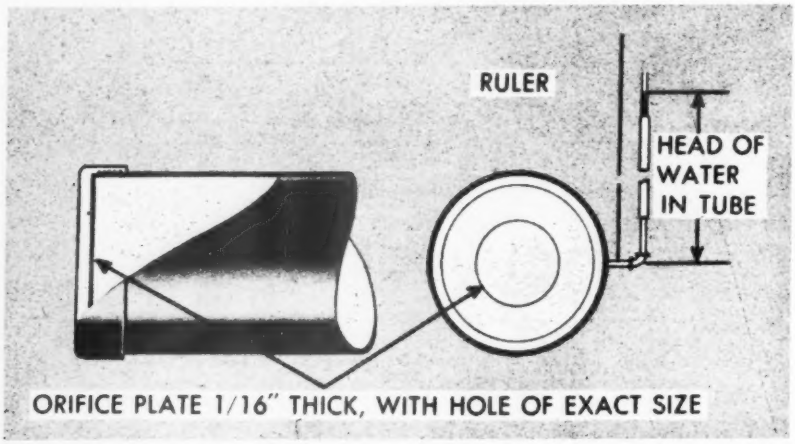
Courtesy Edw. E. Johnson, Inc.

ing through partition B and over partition C. A block of wood (W) is nailed level to, and exactly two feet from, the top of partition C. The "head" of water passing over partition C is measured in inches by a rule placed on block W. Referring to Table 1 we find that the gallons per minute are given at heads varying from 1 to 8¾ inches. If, for example, the head measure on block W is 4½ inches, what is the volume being pumped? Answer—343 gpm.

2. Triangular Weirs — with 90° V Notch. Portable weirs of this type may be constructed in accordance with the accompanying sketch (Fig. 2).

When the equation $Q = 2.54A^{5/2}$ is used, distance A is easily determined, but must be measured at least 2½ times distance A upstream from the

Fig. 3. Circular orifice weir



V notch. Table 2 gives the volume of water in gallons per minute when discharged over 90° triangular weirs.

3. Circular Orifice Weirs. One of the easiest weirs to construct and use is the sharp-edged circular orifice, the diameter of which is less than that of the discharge pipe.

A pipe cap machined to permit the installation of various-sized orifice plates will offer a wide range of capacity readings. The cap should be opened in the following manner:

Chuck it in a lathe and cut out the blank end until ½-in. stock remains as a bearing surface for the orifice plate (Fig. 3). Machine the inside of the remaining ½-in. stock smooth to assure good contact surface for the plate. Plates should be made from some rust-resisting metal, such as bronze, Monel metal or stainless steel, 3/16-in. thick, cut to fit closely the inside diameter of the cap. Cut each plate to provide an opening in the exact center, with the edge bevelled to a 45° angle. The top of the angle therefore will represent the diameter of the opening, so care should be exercised to provide exact measurement. Table 3 gives various plate openings for use with discharge pipes of several diameters.

The discharge pipe from the pump can be of any length, but it is common practice to provide an end piece 10 feet long on which the orifice cap and plate are installed. Exactly two feet back from the orifice opening, a small ¼ or ⅜-in. hole is bored and tapped to receive a street elbow or a short nipple and elbow. The fitting should not project beyond the inside wall of the pipe. Another nipple is screwed into the elbow and an ordinary rubber hose connects the nipple

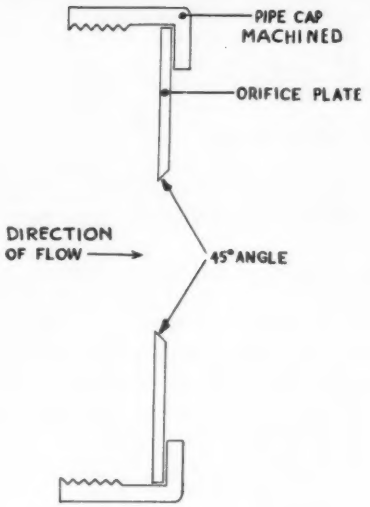


Fig. 4. Details of circular orifice

to a glass tube. For convenience in handling, the rubber hose should be about four feet long and the glass tube 6 to 12 inches long. This device is called a *piezometer* and should be kept in the exact center or mid position at the side of the discharge pipe at all times.

The pressure, or head, on the orifice when water is flowing full stream through it can be measured at any time by noting the vertical distance from the exact center of the orifice to the water level in the piezometer tube. For various combinations of orifice pipe (discharge pipe) and orifice openings, the piezometer tube should be placed at least three diameters back from the orifice opening. In Table 3, 8-in. tubing is the largest orifice which is or should be used with the piezometer located two feet back from the orifice.

There are other means of estimating the discharge flow of water

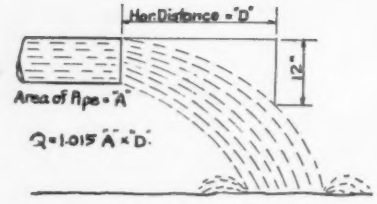


Fig. 5. Flow from horizontal pipe (full)

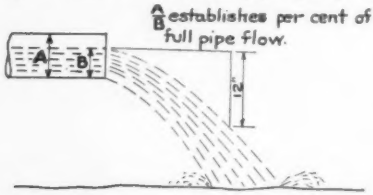
through pipe but they are not as accurate as the three described above. E. W. Bennison of Edw. E. Johnson, Inc., has developed a simple formula which can easily be used to determine the approximate quantity of water being discharged from a pipe. The formula is

$$q = 1.015 \text{ A x D}$$

in which q is measured in gallons per minute, A is the area of the discharge pipe in square inches and D is the distance in inches. D distance is the horizontal distance to a point exactly one foot above the fall of water (Fig. 5). The result will be at least 95% correct if the formula is used only with flows running from full pipes. For quick reference and convenience, Table 4 (page 55) gives q under various pumping conditions.

The flow from horizontal pipes partly filled with water can be estimated if the following measurements are very carefully made and followed with accurate calculations. D is measured as in the above case and calculation made as if the pipe were running full. It must then be determined what portion of the pipe diameter is not filled. This is accomplished by dividing the distance (in inches) of pipe which is taken up by water by the distance which is not taken up by water. In Fig. 6, where A = the inches of water in the pipe and B = the inches of the pipe diameter, A/B = the per cent of full pipe flow. If, for example, water is running through an 8-in. discharge pipe at less than full capacity of three inches from the top of the pipe, this distance, five inches (A), is divided by the pipe diameter, eight inches (B), to give the percentage of the full part of the pipe which is partly filled, or 62½%. If D in this case measures 20 inches, then the estimated flow is approximately 635 gpm, since the pipe is running about ⅝ capacity.

Fig. 6. Flow from horizontal pipe (partly full)



Flowing wells out of a vertical pipe may be measured the same way with certain added factors. The vertical height of the flow above the pipe is measured in inches, and the square root of this figure, multiplied by 5½ times the square of the pipe diameter, will give a fairly close estimate of the flow in gallons per minute. Let's say that the vertical height of a flow is 36 inches above the top of an 8-in. pipe. The 8-in. diameter squared equals 64 inches. Substituting these figures in the equation stated above, we have 64 inches x 6 inches x 5½ = 2,112 gpm, and an estimated figure of 2150 gpm would be about right.

Measuring Drawdown

We have talked a lot about measuring the flow discharged from wells. A driller, however, must also know what effect pumping will have on the water level in a well if he is to ad-

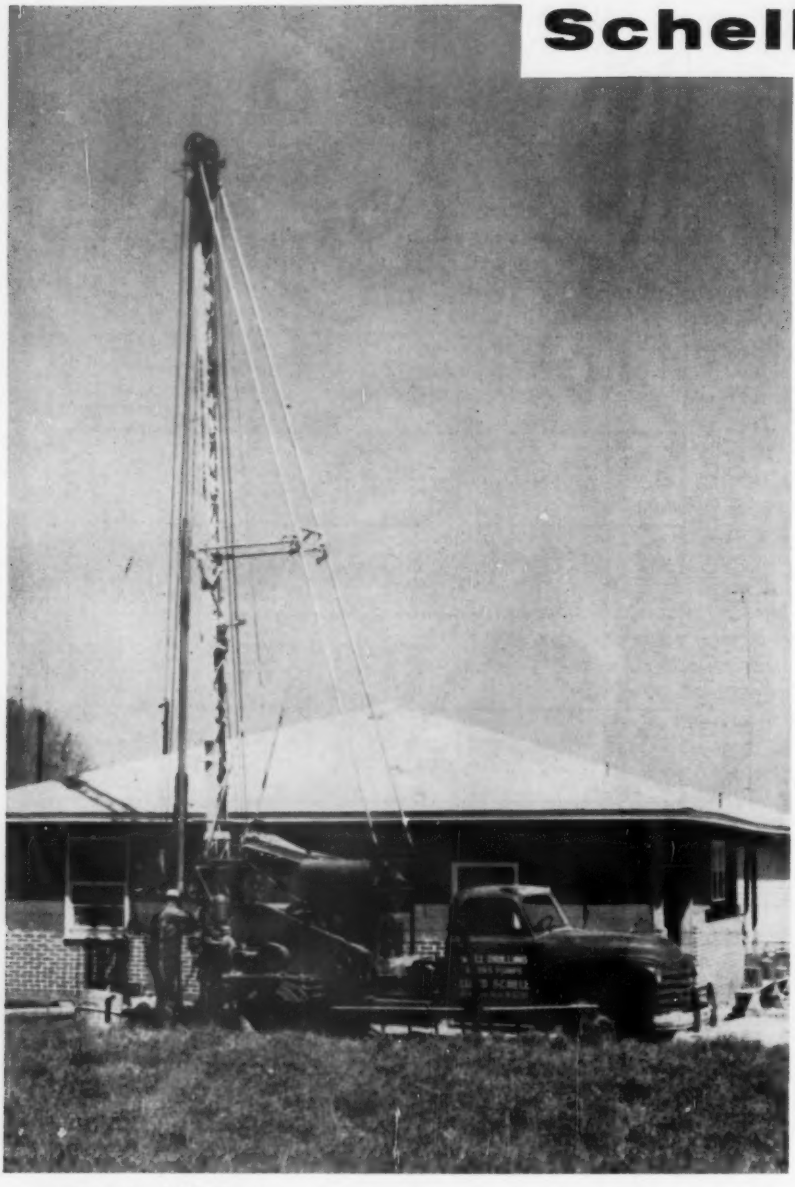
(Continued on page 54)

TABLE 3
TABULATION OF YIELDS FROM CIRCULAR ORIFICE WEIRS
YIELD IN GALLONS PER MINUTE

Head of Water in Tube Above Center of Orifice	4" Pipe 2½ Inch Opening	4" Pipe 3 Inch Opening	6" Pipe 3 Inch Opening	6" Pipe 4 Inch Opening	6" Pipe 5 Inch Opening	8" Pipe 4 Inch Opening	8" Pipe 5 Inch Opening	8" Pipe 6 Inch Opening	10" Pipe 6 Inch Opening	10" Pipe 7 Inch Opening	10" Pipe 8 Inch Opening
5"	56	93	—	—	—	—	—	—	—	—	—
6"	62	102	82	155	300	148	240	380	—	—	—
7"	66	110	88	168	325	160	260	410	370	550	850
8"	70	118	94	180	350	170	280	440	395	590	900
9"	75	126	100	190	370	180	295	460	420	630	950
10"	80	132	106	200	390	190	310	490	440	660	1000
12"	87	145	115	220	425	210	340	540	480	720	1100
14"	94	156	125	238	460	225	370	580	520	780	1190
16"	100	168	132	253	490	240	390	620	560	840	1275
18"	106	178	140	268	520	255	415	660	595	890	1350
20"	112	188	150	283	550	270	440	695	625	940	1420
22"	118	198	158	298	575	280	460	725	660	980	1480
25"	125	210	168	318	610	300	490	780	700	1050	1580
30"	138	230	182	350	670	330	540	850	760	1150	1725
35"	150	250	198	375	725	360	580	920	820	1240	1865
40"	160	265	210	400	780	380	620	980	880	1330	2000
45"	170	280	223	425	820	400	660	1040	940	1410	——
50"	180	300	235	450	870	425	700	1100	990	1480	——
60"	195	325	260	490	950	465	760	1200	1090	1610	——

Courtesy Edw. E. Johnson, Inc.

Schell's



Driller Lloyd Schell had one of his 20-Ws at work here on an 8-in. well for a home being built in Terre Haute. He expected well to bottom at 90 feet.

Shallow Wells

Indiana driller Lloyd Schell puts down a lot of shallow wells for Terre Haute homeowners with his two Bucyrus-Erie 20-Ws. He rarely has seen his rigs stand idle because of a lack of work.

DRILLING contractor Lloyd Schell of Terre Haute, Ind., is one of those fortunate chaps who only on very rare occasions has experienced the uncomfortable feeling which comes with seeing one's rigs stand idle due to lack of work.

According to Schell, who operates a pair of Bucyrus-Erie 20-Ws within a 20-mi. radius of Terre Haute, his rigs have almost always had at least 10 and often as many as 20 jobs lined up for them.

"Not that there isn't any competition around here," stated 46-yr. old Schell, whose size suggests that in his younger days he would have proved a formidable foe as a college football lineman. "There are a lot of good well drillers in the area who really keep us on our toes," he explained. "But the competition isn't cut-throat like some I've heard about in other sections of the country. They've all treated me fairly and have never done or said anything to hurt my business."

Good Potential

The future of the drilling business in the Terre Haute area appears very promising. A lot of families are moving into the outskirts of town and will have to depend on private wells as their sources of water. Schell predicts that capable drillers and pump men will find a tremendous market because of this mass migration to suburban locations.

Water tables have been steadily dropping in recent years, too. This should continue to provide additional business in the form of replacement wells, deepening jobs and well repair work.

Schell claims his 20-Ws are ideal rigs for the type of drilling he's doing. Well diameters in the area range from two to eight inches and depths

Lloyd and Mrs. Schell pose in front of truck-mounted 20-W on job location.

are relatively shallow. Very rarely will a well bottom at more than 300 feet. Although an occasional rock well is drilled, the majority of them are developed gravel wells. Almost all of Schell's wells are of the suburban home type.

One of the 20-Ws, which is powered by a U-2 International engine, is rigged up for jetting; about 50% of the wells it puts down are drilled by this method. Schell himself designed the jetting equipment for this rig. The pump is a 5-in. Goulds model which is operated off the catheads of the rig.

Schell took time out from job to check progress driller Leo Lockard was making on well for home being built several miles outside Terre Haute.

Driller Leo Lockard is the only man on Schell's payroll. Schell and Leo each operate one of the 20-Ws without a helper. When an occasional assist is needed on a job, one is always available to leave his rig temporarily to help the other out.

"I figure a man should be able to average 50 feet of hole per day in this area if he's any good and if he keeps at it," Schell remarked. "Of course, you have to keep your rig running if you expect to consistently rack up that much footage."

Schell forges all of his drill bits back at the small shop building adjoining his home. He feels that the forged bits stand up better and have a better cutting edge than those which have been hard-surfaced. He also handles all his own welding and mechanical work.

The shop and storage building, a compact 10′ x 12′, will soon be replaced by a larger 26′ x 36′ structure Schell is erecting himself during his spare time.

Lloyd has found it unnecessary to keep large stocks of casing on hand because of the proximity of his supplier, who is located right in Terre Haute. He rarely keeps more than 200 or 300 feet of 5⅝-in. casing in stock at any one time. Most of his casing requirements are filled through delivery of the material right to well locations.

On 95% of the wells he drills, Schell takes care of the pump installation, too. He will occasionally take on a well repair job but shies away from this type of work whenever possible.

For a number of years, Schell was associated with his father in his

Here Schell (left) and Lockard inspect cuttings from hole to determine ground formation being penetrated, Schell and Lockard each operate one of 20-Ws alone.

plumbing and pump business. In 1954, he bought his first water well drill and began drilling wells in the Terre Haute area.

This wasn't his first contact with the water drilling field, however. When he was only 12 years old, he began dressing bits for his dad, who at that time was drilling water wells with an old steam boiler rig. "Dad was active in his water well drilling business for about 15 years, covering a territory all the way from Flat Rock, Ill., to Poland, Ind.," Schell revealed. "It actually ended as a result of a mishap which occurred while dad was drilling an exploratory hole through an old coal mine shaft just outside Terre Haute. One night, the mine caved in and the drill, coal tipple and all were lost. It was impossible to recover the drill. That was when dad decided to go into the plumbing and pump business."

When visited by *The Driller,* Schell had just started cable-tooling an 8-in. well with one of the 20-Ws for a new home which was under construction in Terre Haute. His precise estimate of what would be encountered while drilling the hole indicated his intimate knowledge of the area's underground formations and conditions. "I expect that I'll be drilling through overburden for about 25 or 30 feet," he prophesied. "Then I'll run into hard-pan to about 80 feet. This will be followed by limestone to 90 feet and finally, beneath the limestone, slate. I'll have to case the well to the

point where the limestone formation occurs at around 80 feet. The pipe will be slotted and gravel fill will be put around it for the last 20 feet of its length. The well will then be drawing from three formations for its water supply — hard-pan, limestone and slate."

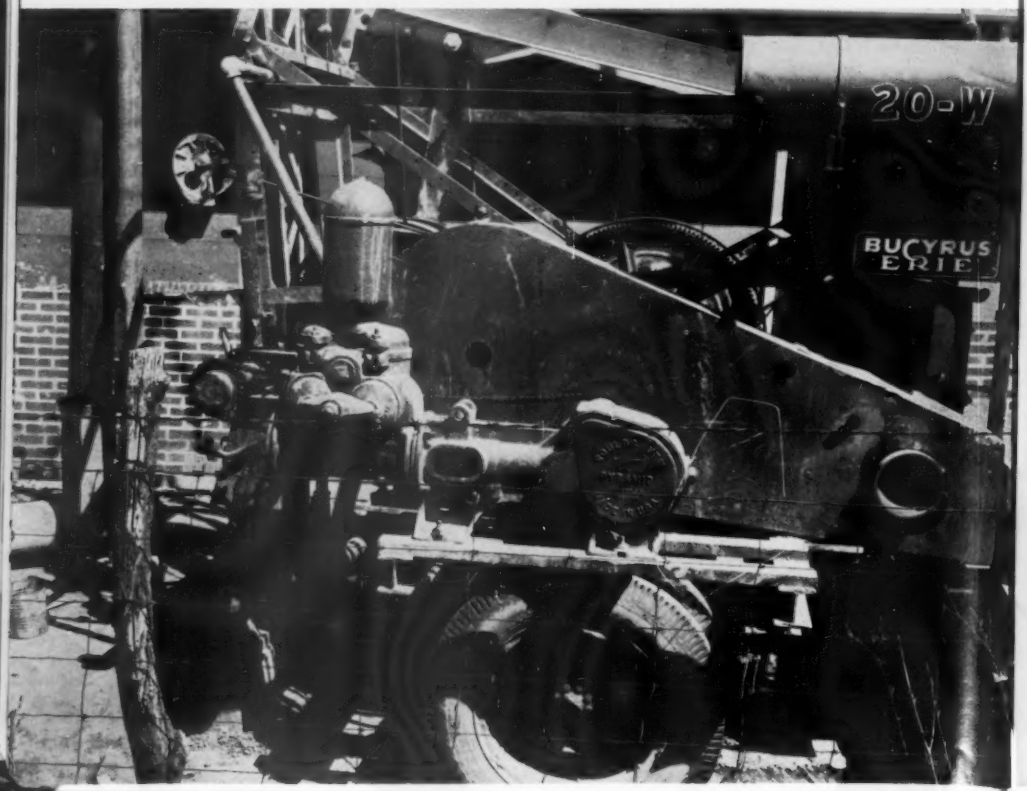
Just a block from where Schell was drilling this well, he jetted one some time ago for another home. That well was a 2-in. diameter job that finished in gravel at 60 feet. According to Schell, 500 gph of water can be pumped from this well with a ½-hp pump.

Leo Lockard had the other 20-W, which is powered by an IX-A Hercules engine, busy on another well for a home being built several miles outside Terre Haute. He had just come off a 5-in., 303-ft. deep well which had presented more than its share of problems. Schell explained the troubles they had encountered on this well: "The customer came out and informed me that he wanted a 4-in. well drilled. We went ahead according to his instructions and put down the 4-in. hole to a depth of 60 feet. We ran the pump for two hours without shutting it down and the water cleared up beautifully. Just eight days later we received a call from this customer, informing us that the well had started to pump sand.

"We went back to his place," Schell continued, "set our rig up over the same hole, enlarged it and set 8-in. diameter casing to 150 feet. We tried to clear up the well but it continued

(Continued on page 52)

This shows pump arrangement Schell has rigged up on one of his 20-Ws for use in jetting. About one half of the wells he puts down with this rig are jetted.



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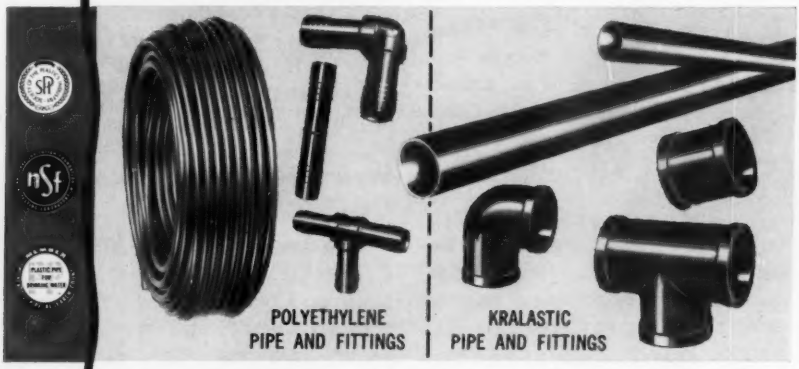

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JOHNSON PLASTIC CORPORATION

CHAGRIN FALLS, OHIO

News of the month

Bucyrus-Erie Drill Plant Wins "Top Ten" Award

In picture above, P. H. Brickhead (left), vice-president of Bucyrus-Erie Co., South Milwaukee, Wis., accepts the handshake of M. J. Murphy, editor of FACTORY magazine, at the publication's Silver Jubilee Awards Banquet, held recently in New York. Bucyrus-Erie's new $12-million Drill Division plant at Richmond, Ind.—illustrated in a full-color framed painting as were each of the award winners—was named one of the Top Ten plants of 1959.

Select Winners

The winners were selected from more than 700 entries in the 25th annual "Top Plants" competition conducted by the magazine among factories which were all new and completed in 1958. As designer, engineer and builder of Erie's award-winning plant, H. K. Ferguson Co., Inc., Cleveland, Ohio, also shared in the award.

Two other Wisconsin firms received Top Ten awards—Square D Company for its new facilities in Glendale and Cutler-Hammer, Inc., for its plant at Lincoln, Ill.

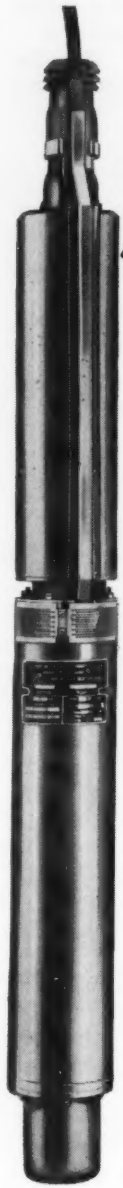
Well Cleaning Compound Developed by Calgon

Announcement has been made by Calgon Co. (division of Hagan Chemicals & Controls, Inc.) of a new chemical compound. It was developed for use in toning up and maintaining well capacities.

The preparation dissolves mineral deposits, cleans clay and silt from well screens and surrounding water-bearing strata, and destroys bacteria and other micro-organisms growing in the well.

Called *Weltone,* the compound is a preparation containing Calgon (a water conditioner), a chlorine-type

For real pumping efficiency . . .



Nothing beats the super-smooth die cast impellers and stages of SUMO submersibles

Super-smooth, accurately matched precision die cast bronze impellers and stages are a feature of Sumo pumps. First, bronze is the *only* material that offers a proved combination of long life, corrosion resistance and toughness under all operating conditions. Second, die casting insures impellers and stages of super-accurate dimensions and ultra-smooth surfaces for maximum water flow and efficiency. What's even more important, bronze won't change shape or distort under water. It provides maximum pumping efficiency from the very first day of operation.

For the best in pump performance, insist on a SUMO submersible . . . . the pump that features solid bronze die cast impellers and stages.

GET THE FACTS ON THE NEW SUPER-SUMO
Here is a *quality pump* that sells at *economy pump prices!* Get details on this amazing new 4" pump. Write for Bulletin B259.

DISTRIBUTORS! Write for details on the possibility of handling the Sumo line of ⅓ to 120 hp submersibles.

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The Complete Line from 1/3 hp to 120 hp

sterilizing and disinfecting agent, and a wetting agent for better penetration.

The company recommends that wells be cleaned with the compound as soon as capacity has dropped noticeably. This drop, of course, should not be due to a falling water table or mechanical failure of the pump or casing.

Weltone does not harm metals or concrete and, unlike acid, generates no dangerous fumes, the company claims. It can be used in almost all wells with the pump in place, even in concrete-cased wells.

For literature on cleaning wells and maintaining well capacities, write Calgon Co., Department TD, Box 1346, Pittsburgh 30, Pa.

Tait Broadens Rapidayton Jetstar Line

Single and two-stage vertical jet pumps have been added to the line of Rapidayton *Jetstars* made by the Tait Mfg. Co. The pumps are especially well-suited to single-pipe applications on 2-in., 2½-in. and 3-in. wells.

The single-stage model, available in ⅓ and ½-hp, is designed for wells 20 to 80 feet in depth and delivers up to 810 gph.

The two-stage pump is equipped with ½, ¾ and 1-hp motors, reaches to 150 feet and gives up to 965 gph. The two impellers give full capacity at 40 lbs. pressure.

The pump is easy to install because of a recessed base which fits directly over the well casing on double-pipe installations, or bolts directly on single-pipe well adapters, the company claims.

All motors are heavy-duty capacitor type; the motor shaft does not touch water, since impellers are coupled outside the pump. Basic parts are interchangeable with Rapidayton Champion jets for simplified inventory.

For information write The Tait Mfg. Co., Dept. TD, Dayton, Ohio.

Alaska Driller Sends Tips on Blasting Boulders

Gentlemen:

I thoroughly enjoy your publication and look forward to receiving it each month.

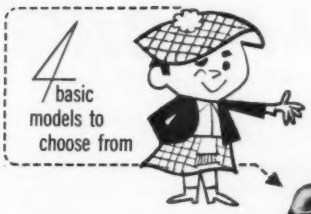
During the past five years I have been developing a foolproof technique

Driller Paul Bergstedt shows off carcasses of typical big game animals he often bags on hunting trips in Alaskan wilderness.

for blasting boulders. Your readers might appreciate this information.

The area surrounding Anchorage, Alaska, is an extremely upset glacial moraine. This results in drilling procedure in which casing must follow the drilling as close as one inch. Granite boulders occur frequently and range in size from 12 inches to 10

(Continued on page 32)



McDonald's new Century line of jet water systems

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Compare the GPH for each new Century-Line Jet (we'll send you specs) with any competing line. Century Line Jets give you more capacity to sell per dollar.

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from the MAILBAG

This page is open to any of our readers having questions to ask relating to drilling, driving pipe, dressing bits, etc. All letters will be answered promptly by experienced drillers and engineers, who are qualified to give intelligent advice on these subjects. We will publish as many letters of general interest as space will permit. Address: The Driller, South Milwaukee, Wis.

Anticipates Trouble with Sulphur-Bearing Rock

Gentlemen:

We are about to drill a 4-in. well into a limestone formation for a customer who wants a production of around 75 gpm.

There is a black sulphur formation at somewhere around 300 feet. We will have to go as deep as possible to obtain the required gallonage. We are wondering, if we should break into the sulphur-bearing rock, if there is any way to re-seal this rock to close out the sulphur. We will greatly appreciate any advice you can give us on this matter.

B.P.G. Indiana

To begin with we question whether you will be able to pump 75 gpm out of a 4-in. well at a depth greater than 300 feet. Considering the conditions, we feel it would be best to start with a 6-in. or 8-in. hole instead. The main reason for increasing the diameter is to permit reductions in the size of the hole if necessary and to provide enough space for the installation of large capacity pumping equipment.

Regarding the bad water which you state you might get at about 300 feet due to sulphur-bearing rock, there is a way to seal this formation out.

Describes Methods

One way is to drill below the sulphur-bearing formation, set a string of pipe with a well packer on the bottom end, and also a packer on the top of the casing that extends just above the sulphur-bearing rock. These packers can be either rubber or lead and may be obtained from almost any well supply dealer.

The other method, and in our opinion this will give you by far the best seal, is to have this liner pressure-cement-grounted in. This reason is — if this upper packer is set in any place where the rock structure is not watertight, or if either of the packers do not have a perfect seal, the two waters could still intermingle. A good cementing job would relieve all chances of this happening.

Some grouting work is now being done with plastics, which in some respects is considered better than cement and cheaper, too.

"You know darn well, Mr. Haskins, that you have to pay us cash for that well we drilled you."

Look what happens when one of your customers hits the "Start" button on his BERKELEY TURBINE

He gets full-rated capacity at the pressure you promised. You *know* his sprinklers are putting out . . . that his ditches are full . . . because you hit his conditions right on the nose.

Why can you have this confidence? Because of Berkeley's broad selection of sizes. When you offer your customer a Berkeley, you help him select from one of the industry's most diversified lines. You are sure of finding a Berkeley Turbine to meet his conditions . . . every time.

Find out for yourself why Berkeley is one of the fastest growing lines in the business. Let Berkeley quality and service make you a "big leaguer" in the field. Send for our "Be a Berkeley Dealer" kit. Use your letterhead, please. If you act today, we'll send you a plastic covered note-pad with gold leaf for personalizing . . . absolutely free!

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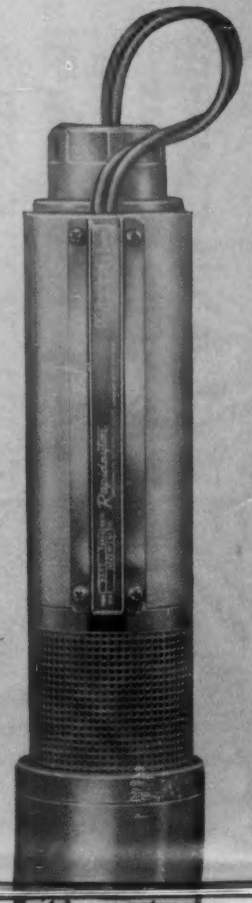


new ⅓ h.p. 2-wire "3 STAR" reaches to 90 ft. at full 40 lbs. pressure

Big volume in submersibles is now assured. Not next year, or next month. But today! Again Tait leaps far ahead of the industry with this new ⅓ h.p. Rapidayton "3 STAR"—a quality-built 2-wire submersible pump with the world's most advanced motor, high performance characteristics, and a jet pump price! In a word

1/3 h.p.

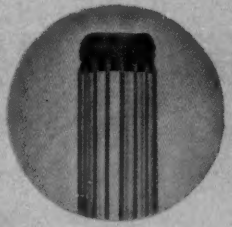
down to 90 feet at 40 lbs.

2-wire pump including

performance characteristics, and a jet pump price! In a word [illegible] ½ h.p. pump of field-proven design, which reaches a depth of 90 feet at a full 40 lbs. pressure, retailing at only $164.50, including 60 feet of factory attached cable and overload protection. Here's ONE submersible pump model capable of capturing up to 80% of the entire jet pump market. If you are not now selling subs, here's the way to maintain a simplified inventory while getting into this booming, profitable business. Act now.

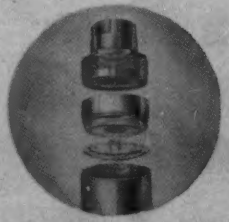
new ½ h.p. 2-wire "5 STAR" for greater capacity and pressure: $194.50 retail

New Concept in Submersible Motor Design



Through Tait's superior engineering and testing facilities a completely dependable heavy-duty 2-wire motor has been built which requires no capacitors or starting relays. This "plus power" motor, the most advanced in the industry, is oil-filled and has an electronically tested leak-proof seal. Exclusive two-piece stator construction permits the use of more copper and more insulation.

Coaxial Diffuser Gives 56% More Pressure



Larger hydraulically-balanced nylon impellers and a coaxial diffuser give Rapidayton submersibles 56% more pressure per stage. The exclusive "Double Life" stage design, with nylon-to-stainless steel bearings, has proven its outstanding superiority in resisting abrasion in the toughest installations from coast to coast. When you sell Rapidayton you sell superior performance and dependability.

Other Rapidayton 4" subs in 2- and 3-wire models; 6" sizes in single and three phase models.

Rapidayton
DIVISION

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CITY _____ ZONE _____

STATE _____

Please Check ☐ Dealer ☐ Wholesaler

News . . .

(Continued from page 26)

feet in diameter. When pulling the casing back to blast a boulder, the formation will cave in and fill the hole back to the pipe. This involves the costly and time-consuming procedure of setting the charge and jacking the casing back, with the possibility of a misfire. Misfires in this case are very dangerous.

Gives Solution

When a boulder is encountered, the hole is cleaned to allow a charge to be placed in contact with the boulder. It is very important to have accurate measurements of the depth of the boulder. First: Tape two bundles of 60% dynamite, 10 to 15 sticks in each bundle. Lower or drop them in the hole. I use 20 to 40 sticks of 1⅛-in. dynamite for boulders below 30 feet. Second: Assemble five joints of the cheapest 5-in. stove pipe available, lock the joints with solder or small sheet metal screws. Lower or drop this on top of the dynamite.

Check measurements to be sure of the placement of stove pipe and charge. There is no primer in the charge at this time. Third: Using a bottom or top knocker, or spear, pull casing back six to eight feet. Fourth: After withdrawing tool from the hole, prepare a one to two stick charge with an electric cap and blasting wire marked off to the proper depth of the hole where the main charge lays. Fifth: Run the primer charge in the hole through the 5-in. stove pipe to rest on the main charge. Check measurements. Fill the hole with 50 gallons or more of water. Sixth: Take all normal precautions, clear the area, move cars, etc. Shout "Fire in the

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hard rock drilling

The Mission HAMMERDRIL® is a "bottom hole," pneumatic impact tool, rugged enough to drill through the hardest of rock formations *day in and day out.* The HAMMERDRIL is designed and built for long life, low upkeep. There are two moving parts in the high pressure, and only three moving parts in the low pressure tool. All impact parts are of heat treated high alloy steel. All moving parts are "Missionized"®—a special surface treatment—to reduce corrosion, friction, wear, and galling.

Eight years of development and testing by Mission have gone into the HAMMERDRIL, to make it reliable and economical in use. In addition, the HAMMERDRIL can be used on your present standard rotary rig with suitable air compressor capacity.

The Mission HAMMERDRIL is sold and serviced throughout the United States. Write to Mission for more information and for what HAMMERDRIL can do for you—faster drilling, lower cost per foot.

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CENTRIFUGAL PUMPS

hole," and set it off with a battery or magneto. If a misfire occurs, run in another 1-stick primer on the misfire.

Before I developed this method, I had always dreaded blasting because of failure to break the boulder, or breaking the shoe, or drilling up a misfire with six feet of clay and gravel on top of the live cap.

I extend to you and your readers an invitation to visit us in our great 49th state. The fishing and hunting are the greatest.

Sincerely,
Paul R. Bergstedt
Spenard, Alaska

Peerless Pump Introduces New GPM Turbine Pump

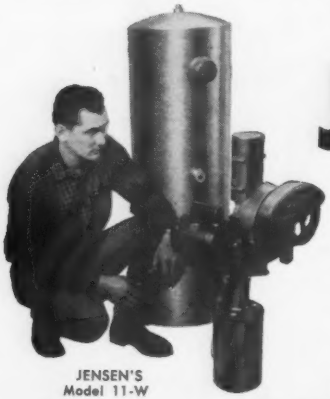
A new deep well turbine pump designed primarily for irrigation pumping has been placed on the market by Peerless Pump Div., Food Machinery and Chemical Corp.

Trade-named the *GPM,* the new pump is currently being offered in both oil and water-lubricated models. The *GPM* has capacities up to 1,600 gpm. It is available with drivers ranging from five to 125 hp. Settings to 300 feet may be readily handled with the pump.

Construction features include open line shaft construction on the water-lubricated model and an enclosed line shaft on the oil-lubricated type. Both models have "hi-fired" vitreous-enamel-surfaced impellers to insure maximum long life and high, sustained efficiency. Long sleeve, bronze-bushed bowl bearings are standard construction on both models.

A new bulletin, designated as No. B-800, containing cutaway sectional views, operating characteristics and

Install in minutes by simply threading to the drop pipe . . . .



JENSEN'S
Model 11-W

JENSEN'S
Model 11-W

Here's a water system that will save your customers money where they need it most . . . in normal, day-to-day operations. IT'S PERFECTLY COUNTERBALANCED to pump *more* water with *less* power—up to 50 per cent less!

WRITE TODAY FOR CATALOG AND ATTRACTIVE DEALER DISCOUNTS ON ALL 15 SIZES.

JENSEN WATER SYSTEMS
Made by JENSEN BROS. MFG. CO., INC., Coffeyville, Kansas

You Really GO Places--

when you OFFER

AURORA *Mainliner* CONVERTIBLE-JET WATER SYSTEMS

Mainliner with Shallow Well Head

SIZES
Available in ¾, 1, 1½, 2 and 3 h.p.

LIFETIME MATERIALS
Pump Shaft is of Stainless Steel. Impeller, Sealing Ring, Jet Nozzle and Jet Tube are of Solid Bronze

SATISFACTION
AURORA Mainliner JETS are FULLY GUARANTEED

WRITE for BULLETIN 133-MLA

The modern Mainliner packaging simplifies order control, minimizes storage and provides easy LOW COST conversion from Shallow Well to Deep Well (Twin or Single Pipe) setting. Mainliners are built to deliver top performance through extra years of full satisfaction. Find out how these easy-to-sell, customer-pleasing Mainliners can create generous profits for you, too.

AURORA Always PUMPS

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AURORA® PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY

620 LOUCKS STREET • AURORA, ILLINOIS

LOCAL DISTRIBUTOR IS LISTED IN THE YELLOW PAGES OF YOUR PHONE BOOK

performance data can be obtained free by writing to: Peerless Pump Div., Food Machinery and Chemical Corp., Department TD, 301 West Ave. 26, Los Angeles 31, Calif., or 2005 Northwestern Ave., Indianapolis 8, Ind.

Duro Announces Shallow Well Water System

A new, self-priming, shallow well water system has been announced by the Duro Co., Dayton, Ohio. Called the Duro *Jet-Ace,* the unit is available in both vertical and horizontal tank models. Impeller, venturi and nozzle are of bronze.

The ⅓-hp NEMA standard motor has a polished stainless steel shaft and overload protection. The entire unit carries a full year guarantee.

For complete information write to: The Duro Co., Department TD, Dayton 1, Ohio.

Barnes Adds Three Models To All-Purpose Submersible Line

Three new submersible water systems in 1½, 2 and 3-hp sizes have been added to the Barnes submersible line to increase the depth ratings to 1,050 feet and the capacities to 895 gph, the company announced recently. The three new models supplement the present ½, ¾ and 1-hp submersibles available from the company and are designed for wells 4-in. in diameter or larger.

Full details on the complete line of submersibles are available in a descriptive folder available from the Barnes Manufacturing Co., Department TD, Mansfield, Ohio.

New Book Discusses Collection and Use of Hydrologic Data

Every estimate indicates that the population of the United States will explode well over the 200 million mark by 1975—a development which heavily underscores the present need for a better knowledge of our natural water supplies. How we can best cope with the crucial information-gathering problem now before us is explained in a new book published June 1—Water Facts For The Nation's Future—Uses and Benefits of Hydrologic Data Programs, by Walter B. Langbein and William G. Hoyt (The Ronald Press Co., $5.00).

Sponsored by the Conservation Foundation, the book evaluates existing federal and state hydrologic programs for collecting, interpreting and publishing water data. It gives practical suggestions for future expansion and improvement and outlines the specific steps which must be taken if these programs are to furnish the factual information indispensable to intelligent utilization of our water supplies. A guide to concrete remedial action, the book offers an illuminating analysis of a problem of immediate

Plastic Pipe ad with no picture?

Why no picture?

A picture can be deceiving. Almost all plastic pipe looks the same... some even looks like metal pipe. The difference is a matter of service ...and piping that goes wrong can be mighty expensive. A picture means nothing... but...

There are scores of brands of plastic pipe on the market... made of many different kinds of plastic materials... wonderfully improved over the early plastics. All are labeled "rust resistant"... but total results may be good, bad, or indifferent depending on the choice you make. Here's what to look for:

The universal material? No such thing. No one plastic (no *metal*, for that matter) can handle *all* liquids... no one has all the properties required of a truly universal pipe. Closest to it are Ace Riviclor (Rigid PVC) and Ace-Ite (ABS rubber-plastic blend). Riviclor is a little better on chemical resistance, and Ace-Ite is a little better on impact strength and heat resistance. Both cost about the same, are rigid, and come in 20′ lengths. Ace Supplex (Polyethylene) is flexible; comes in 100′ to 400′ coils. All are OK for drinking water and also for chemicals used in treating water. Of course they're immune to rust, rot, soil and electrolytic corrosion.

Are plastics fully approved for drinking water? Yes... the National Sanitation Foundation at University of Michigan attests with this seal that they regularly test Ace Riviclor, Ace-Ite, Ace Supplex and certain of our other brands of plastic pipe, and certify them non-toxic. These materials are odorless and tasteless as well as non-toxic.

Are plastics strong enough? Hundreds of water works and thousands of chemical plants (all very critical people) say *yes!* Plastic pipe is now available in several wall thicknesses for working pressures to 490 psi. It takes plenty of hard knocks, and resists accidental cutting and damage quite satisfactorily.

Where do I use it? For wells and farm water systems. For construction job water lines, industrial piping, mine drainage systems. For lawn and golf course sprinklers... recirculating water lines in air-conditioning. We've supplied miles of pipe for successful installations. If you haven't yet put some underground for test, it's time to start. Nothing takes the place of *personal* experience.

How can I dodge the pitfalls of "trial and error?" Go to a company that has no axe to grind... a company with the widest experience. We, for instance, supply eight different kinds of pipe... with fittings and valves to match. For truly unbiased advice... backed by 100 years of experience... and prices as low as you'll find anywhere... come to American Hard Rubber Company.

★

Write John R. MacKay, 200 East 42nd Street, New York 17, N.Y. for literature kit ARS-1; most complete information available from any manufacturer. No cost or obligation.

ACE Rubber & Plastics Equipment

by **AMERICAN** Hard Rubber Company

division of **AMERACE** Corporation

concern to every thinking American citizen.

The authors are both water-management experts of wide experience. Walter B. Langbein is a hydrologist for the U. S. Geological Survey. William G. Hoyt formerly served as Director of the Power Division, U. S. Department of the Interior.

Deming Appoints Monahan District Representative

The Deming Co., Salem, Ohio, has announced the appointment of J. A. Monahan as district sales representative.

Monahan will call on Deming customers and prospects in Nebraska, Kansas, Iowa and part of Missouri. He was formerly employed in the sales and service department of the Toledo Scale Co. He attended Kent State University and Youngstown University. He will have headquarters at the company's main office in Salem, Ohio, until permanent headquarters can be set up in his territory.

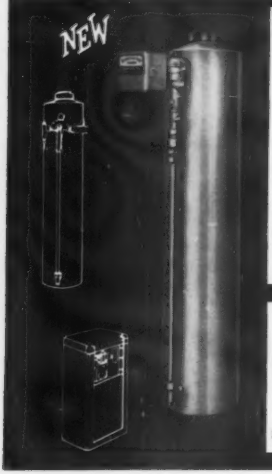
Polyethylene Pipe Guaranteed Five Years

Yardley Plastics Co., Columbus, Ohio, has unveiled a polyethylene piping which it claims has a new standard of excellence.

The company announced that its superior polyethylene pipe is to be backed by a five-year guarantee. Improved long-term stress-live properties of the pipe over other polyethylene pipe enabled Yardley to issue its guarantee, according to officials of the firm.

Company officials said a new high-strength polyethylene compound is

THE *Radiant* LINE OF
WATER CONDITIONERS



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FILTERS
for Homes and Industrial Plants
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- Acid Neutralizers
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Available in Automatic Models—requires no customer attention, as well as Manual models.

HYPER CHLORINATORS
for Chlorination, Algae Treatment, Poultry Medication, and many other uses
Precision built, completely encased, easily installed

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Send one of these after that pipe!

RAMPP

FOX TRIP

Casing Spears

For faster, more efficient recovery of pipe use RAMPP Fox Trip Casing Spears. They are manufactured in two, three and four slip design. The three or four slip is recommended as it enables the slips to contact the entire circumference of the pipe and prevents it from becoming elongated.

RAMCO—10752

Write for full information and prices.

RAMPP Company

directly responsible for the increased durability of the product, trademarked "Golden Jet."

Engineered specifically for both shallow and very deep water wells, Golden Jet can be used with all types of single and multi-stage jet pumps. Golden Jet pipe is available in 100 and 300-ft. coils. Insert fittings, made of nylon in 1-in., 1¼-in. and 1½-in. diameters, are manufactured for use with this pipe. The new pipe can sustain a recommended working pressure of 40 psi at 195 feet pumping water level, 50 psi at 170 feet pwl and 60 psi at 150 feet pwl.

For further information write Yardley Plastics Co., Department TD, Columbus, Ohio.

Goulds Introduces 42-Gal. Tank-Mounted Systems

New 42-gal. tank-mounted water systems have been introduced by Goulds Pumps, Inc., Seneca Falls, N. Y. The units are available either with *Prime Flow* deep well pumps or *Shallow Flow* shallow well pumps.

All cast iron parts coming in contact with the water are protected against rust and corrosion. A non-toxic, alkyd melamine, resin finish is baked on in infra-red ovens. All ratings are within the working limits of the motor as recommended by the motor manufacturers.

Both ⅓ and ½-hp units are available. The *Shallow Flow* has capacities to 1,050 gph, depths to 25 feet; the *Prime Flow* has capacities to 830 gph, depths to 90 feet.

For more information on these 42-gal. tank-mounted units, write to Goulds Pumps, Inc., Department TD, 51 Black Brook Rd., Seneca Falls, N. Y.

When writing advertisers, please say you saw it in *The DRILLER*

New Deepwell Turbine Unveiled by Byron Jackson

A new deepwell turbine pump claimed to feature important design improvements has been unveiled by Byron Jackson Pumps, Inc.

Called the Type G, the new deepwell pump is designed for widespread general application by farmers, industry, municipalities and other primary water supply users.

A major design improvement in the oil-lubricated Type G series is a new, extra-long throttle bushing that serves as a bearing and by-pass seal.

Collet-type impeller mountings are another major design innovation on all Type G pumps. The impeller is assembled by driving in a tapered steel collet. The lock collet has a longitudinal split, causing the collet to tighten on the shaft as it is driven into the impeller.

The pumps also feature a new stuffingbox assembly that eliminates the old-fashioned packing ring.

Type G pumps can be driven by direct-connected electric motor, right-

(Continued on page 44)

GE NEW OIL-FILLED SUBMERSIBLE PUMP MOTOR

NOBODY . . .
BUT NOBODY
BUT . . .

SPANG

makes a completely

weldless

alloy-steel

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drills up to 4 times more footage-with fewer fishing jobs

For Cable Tool data and catalog see your Spang dealer or write to:

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For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Prospect Drilling and Shot Blast Holes.

NEW OIL-FILLED SUBMERSIBLE PUMP MOTOR

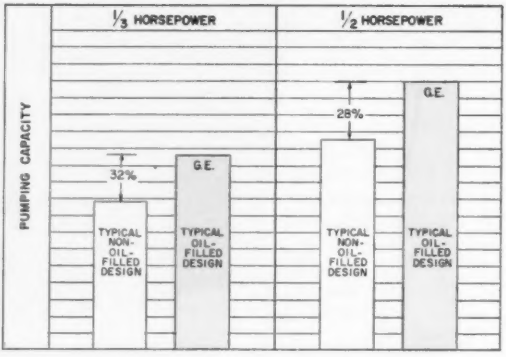
(4) Flexible Buna N oil reservoir allows expansion and contraction with changes in temperature

(5) Heavy-duty steel spring maintains positive internal pressure on oil supply

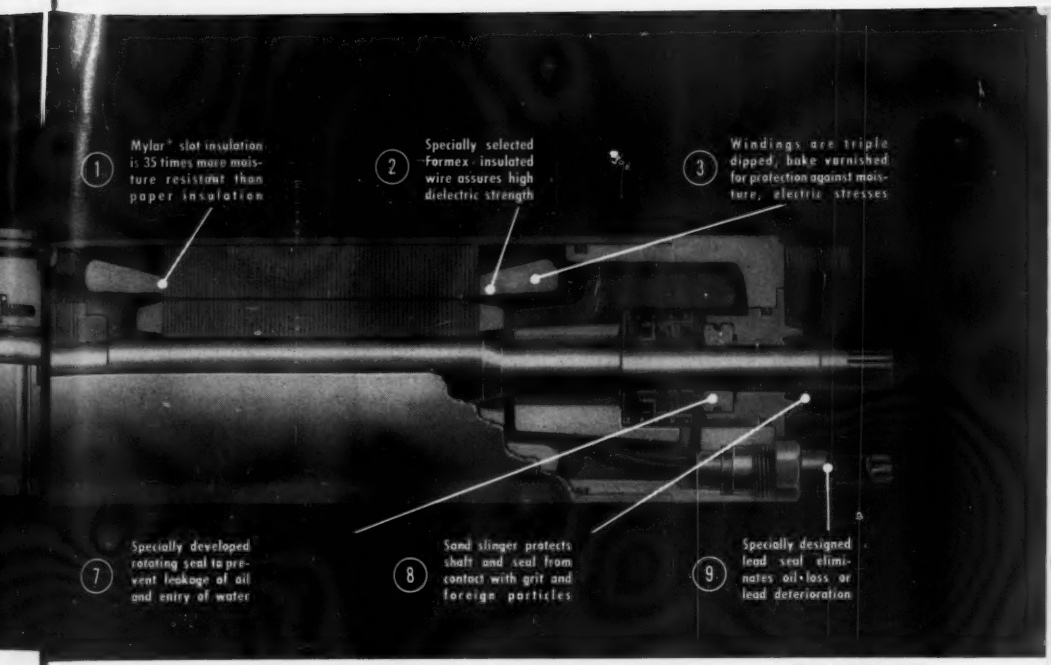
(6) Reservoir contains 900 cc of highly refined, tasteless, odorless mineral oil

UP TO 32% MORE

PERFORMANCE PROVED in the laboratory and in the field. In actual tests General Electric's submersible pump motors have each cycled more than 700,000 times without noticeable loss of oil—the equivalent of more than 20 years' normal operation.



WATER-PUMP TESTS PROVE that the new General Electric pump motor's extra load-carrying capacity enables it to deliver up to 32% more water per rated horsepower. The above graph illustrates how the new General Electric one-third horsepower oil-filled submersible pump motor has the capacity to do many jobs which formerly required one-half horsepower submersible motors. Similar savings are available in other ratings.


1
Mylar* slot insulation is 35 times more moisture resistant than paper insulation
2
Specially selected Formex-insulated wire assures high dielectric strength
3
Windings are triple dipped, bake varnished for protection against moisture, electric stresses
7
Specially developed rotating seal to prevent leakage of oil and entry of water
8
Sand slinger protects shaft and seal from contact with grit and foreign particles
9
Specially designed lead seal eliminates oil-loss or lead deterioration

40% ACTUAL SIZE

WATER PER RATED HP

General Electric's experience in successfully powering more than 30,000 submersible pumps during the past 7 years—plus the know-how gained making larger oil-filled submersible pump motors—has now been applied to the design and production of its *new* oil-filled submersible pump motor for four-inch well applications.

The new G-E pump motor can carry significantly greater loads without fear of mechanical damage. The motor's *unrestricted* windings, free to expand and contract with variations in temperature, practically eliminate the adverse effects associated with stalled and other overload conditions.

This means dollar savings for you, because a new ⅓-HP G-E motor can do many jobs that formerly required a ½-HP motor. G.E.'s ⅓-HP unit can safely deliver 32% more water per rated horsepower. Similar savings are available in other horsepower ratings.

Take advantage of General Electric's dollar-saving features, *plus* the quality design features shown above. Make sure that the next pump you buy or install is equipped with a new G-E oil-filled submersible pump motor, or G-E motor parts.

For further details, contact your nearby General Electric Apparatus Sales Office, or write to Section 702-101, General Electric Company, Schenectady, N. Y. (Ask for Bulletin GEA-6853.)

* *Registered trade-mark of DuPont Company*

Registered trade-mark of General Electric Company

GENERAL ELECTRIC

News . . .

(Continued from page 40)

angle gear drive or flat-belt drive from gasoline or diesel engine. Any necessary adaptations can be made to the user's specific requirements.

An illustrated bulletin describing the new Type G pump is available without charge from Byron Jackson Pumps, Inc., Department TD, P. O. Box 70, Lawrenceburg, Ind.

Introduce Submersible Sump Pump

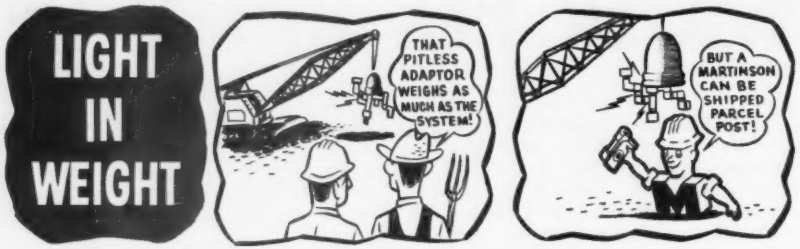
The Deming Co., Salem, Ohio, has introduced its new "Demersible" sump pump to the market.

The new pump is a submersible, combining pump and motor in one compact, complete unit. The motor is totally sealed and oil filled in a cast iron case. It has a stainless steel shaft and impeller nut. The demersible can be lowered quickly into a sump pit for temporary service or permanently installed for continuous service. The pump's controls can easily be located in a convenient place. It is furnished with 30 feet of waterproof cable and motor lifting lugs. An extra large diaphragm prevents oil loss due to thermal expansion and contraction. The pump has a capacity of 15 to 700 gpm.

The new submersible has a semi-open type impeller with a precision bore for perfect alignment. It is keyed for positive drive. Both pump and motor shafts are made of stainless steel.

Bearings in the new pump are the heavy-duty ball thrust type, self-lubricated and sealed in the motor.

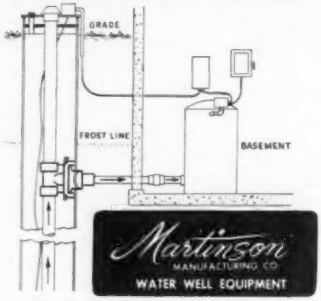
(Continued on page 52)



WITH *Martinson* UNDERGROUND DISCHARGE COUPLINGS

Most pitless adaptors include a set length and weigh over 100 pounds. A patented Martinson doesn't require a set length (except where required by law) and weighs from 7 to 11 pounds. Can be shipped parcel post! Low in cost, rugged all bronze construction. 1", 1¼", 2" for submersibles, 1¼ x 1" and 1¼ x 1½" for ejector pumps, and 1¼" and 2" for working heads.

See your supplier or write for literature and information.



Main Plant SHEFFIELD, IOWA Eastern Warehouse P. O. BOX 256, RAMSEY, N. J.

What a selling plus! And what a wonderful way to be sure of satisfied customers! Point out *you* use *slit-proof* Orangeburg *SP*—the only plastic pipe Guaranteed and Bonded for 20 years for cold water service. *Under terms of the Bond, repairs or replacements* (INCLUDING LABOR COSTS) *due to failure of the pipe will be made at Orangeburg's expense.* The Bond will be made out in your customer's name; for him to keep. After your *SP* installation is completed simply mail *"Request for Bond"* Form to Orangeburg. After approval, Bond will be sent direct to your customer. Why not take advantage of this amazing Bond offer on your next job. See your Authorized Orangeburg Wholesaler or write Dept. D-79

Approved for drinking water by National Sanitation Foundation

ORANGEBURG MANUFACTURING CO. • Orangeburg, New York • Newark, California

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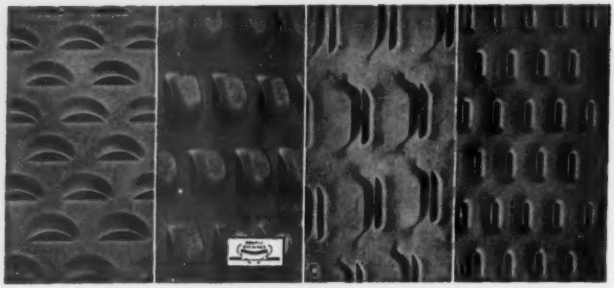
STAINLESS STEEL

WELL CASING

Corrosion is stopped by welded stainless steel casing. If acid or alkaline soil conditions present a problem... then stainless steel well casing is your permanent solution.



4 Perforation Styles

A. LOUVRE. Louvre down keeps fine sand out. Very popular for gravel packed rotary drilled wells.

B. DOUBLE LOUVRE. Up to 50% more perforated area. Up to 8 ga. thickness, min. diam., 10". Very strong.

C. TWIN FLOW. Water enters from opposite sides of perforations 1/2" to 1" long, 1/16" to 1/4" deep.

D. STANDARD. Popular for fine sand at moderate depth. 3' to 21' lengths, as desired.

4 Field Joints

PLAIN END
For welding... popular for modern, quick assembly of black welded casing.

PLAIN END
With butt strap for fast field welding. Line-up holes insure true joining.

LAPPED JOINT
For riveting . . . popular for galvanized, riveted casing. Tapered ends, gang punched.

LAPPED JOINT
For bolting... 5/16" T-head bolts can be installed from outside.

Write for **FREE** well casing catalog.

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Name..... Address.....

City..... State.....

Macwhyte "Hi-Lastic" drilling line has *three times the elasticity* of ordinary wire rope. Tools drop farther per stroke — strike faster, harder blows. As a result, internally lubricated "Hi-Lastic" gives the best service for water-well drilling. It is available from stock in sizes to fit your rig; recommended for drilling to 1,000 foot depth.

Macwhyte "Kilindo" is used where its non-rotating feature is advantageous to the job. Macwhyte sand lines are fabricated from special steel to resist the severe abrasive conditions encountered in bailing.

Bulletin 5813, "Use of Wire Rope in Water Well Drilling," is yours on request.

MACWHYTE *Wire Rope*

2900 Fourteenth Avenue, Kenosha, Wisconsin

Wire Rope • Slings • Cable Assemblies

Distributed and stocked throughout the United States 159

BITS *from the wit sharpener*

A farmer and a professor were sharing a seat on a train. It was getting lonesome, so the farmer started a conversation and they soon became a friendly pair.

"Let's have a game of riddles to pass the time," said the professor, "if I have a riddle that you can't guess you give me one dollar or vice versa."

"All right," replied the farmer, "but since you are better educated than I am, do you mind if I give you only fifty cents?"

"OK," replied the professor, "You go first."

"Well what animal has three legs walking and two legs flying?"

"I don't know. Here's your dollar. What's the answer?"

"I don't know either. Here's your fifty cents," answered the farmer.

Tony (talking on the phone to a mechanic): "I want you to come and feex my automobile—she no go."

Mechanic: "What seems to be the trouble?"

Tony: "I dunno, but the battery, she no bat. De spark plugs, dey no spark. De generator, she no gen. De pistons, dey no work neither."

Before granting a degree, the faculty of a well-known vocational school gave the members of its X-ray technology class a stiff written examination. One of the questions was:

"What is the appendix good for?"

With more worldly than medical wisdom, one student replied:

"From $100 to $400, depending on place of residence and the eminence of the surgeon."

There came a frantic ring over the phone at police headquarters, and a wild voice said, "There's a burglar in Miss Spinster's bedroom at 8490 Blank Street. Send the police at once, for heaven's sake!"

"All right," answered the sergeant, "Is this Miss Spinster speaking?"

"No," came back the anguished voice, "this is the burglar."

A disheveled man stumbled into a psychiatrist's office, tore open a cigaret and stuffed his nose with the tobacco.

"I can see that you need me," the psychiatrist said. "How can I help?"

"Do you have a light?" the man asked.

The wealthy motorist, suddenly finding he was out of gas, coasted into a nearby roadside station. The attendant was a slow-moving individual.

"Here, boy," he said gruffly, "get a move on. I want some gas. You'll never get anywhere without push. It is essential to success. When I was a boy I pushed, and kept pushing, and that got me where I am today."

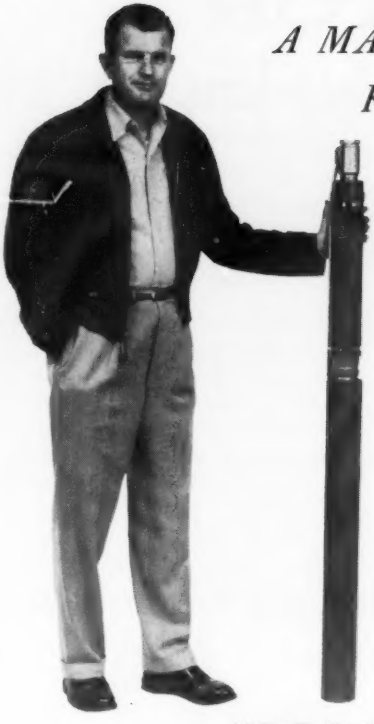
"That sure is fine," replied the attendant, "I guess you'll have to push some more. There ain't a drop of gas in this station."

A gambler died. The funeral was well attended by his professional friends. In the eulogy, the minister said:

"Spike is not dead. He only sleeps."

From the rear of the chapel came the interrupting words:

"I got a hundred that says he's dead."



A MAN WHO KNOWS QUALITY

SELLS REDA

...THE BEST PUMP FOR ANY JOB!

Yes, a Reda Dealer is truly a **"Man who knows Quality."** He sells a product with a **quality** reputation, REDA Submergible Pumps.

A Reda Dealer is known by the quality of the equipment he sells and the service he gives to his community and neighbors. He believes in fair, honest business practices and confidently stands behind the equipment he sells. He **knows** he can do so with **REDA** because of its top quality and superior performance.

HERE IS WHY:

1. **REDA LEADS THE FIELD — The original submergible pump** — the product of over 35 years experience.
2. **A COMPLETE LINE from ⅓ to over 300 H. P.** — over 100,000 units installed.
3. **A SOUND MARKETING PROGRAM** — trained field personnel serve Reda dealers across the nation. Dynamic sales promotion aids and national advertising are designed to **sell** pumps.

If you want to sell Quality and obtain better pump profits, contact REDA TODAY!

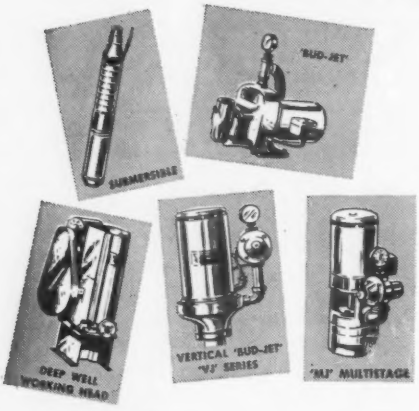
REDA PUMP COMPANY
BARTLESVILLE, OKLAHOMA

BRANCHES OFFICES:

1831 Golden State Highway Bakersfield, California	2909 LaFayette Waterloo, Iowa	702 Austin Highway 80 Midland, Texas
2126 S. Kalamath Denver, Colorado	215 4th Street Trenton, New Jersey	3707 N. McCollough San Antonio, Texas

AERMOTOR

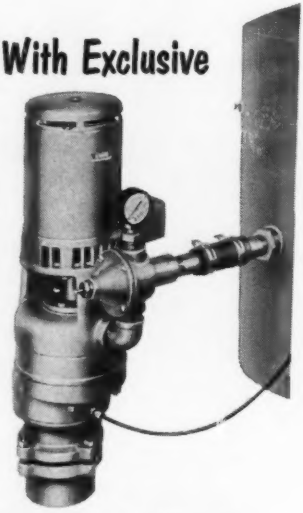
The Complete Line for '59



Now — here's the line with everything you need to capture sales in the BIG VOLUME farm and home pump market. Choose from over one hundred models — be certain you get the pump that's tailored to your job's specific requirements.

AND Aermotor's selling program is tailored to your requirements too! You get BIGGER discounts with Aermotor's contract purchase plan . . . PLUS the support of a consistent consumer advertising program . . . PLUS Aermotor's liberal co-op advertising program. It all adds up to a big year for you — when you sell the line your customers trust — Aermotor.

NEW! 'MJ' Multistage Jet Pump With Exclusive Aermotor "Work Saver" Adapters— Designed to Make Every Job Quicker . . . Cheaper . . . Easier!



The "MJ" is shipped ready to install. No "on the job" connection of regulating valve, pressure gauge, etc. It's all done at the factory. Exclusive "work saver" adapters cut down on lengthy (and expensive) pipe fitting operations . . . give you neat, sure jobs every time. AND you actually save parts! All adapters have built-in slip couplings — offset adapters have side outlets — require no extra fittings at the pump.

Ask to See the New Aermotor 'MJ' . . . TODAY!

Branches: AMARILLO • CORDELE, GA. • DALLAS • DES MOINES • HARRISBURG
KANSAS CITY • MINNEAPOLIS • OMAHA

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"WATER WHERE YOU WANT IT"

"Since 1888, Manufacturers of Quality Water Pumping Equipment"

AERMOTOR COMPANY

2500 W. ROOSEVELT ROAD, CHICAGO 8, ILLINOIS

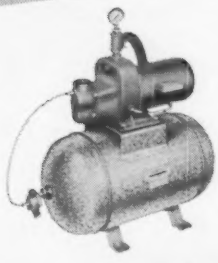
NEW MODELS

NEW RATINGS

NEW SALES APPEAL FOR '59

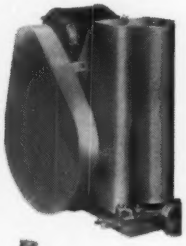
THE "Bud-Jet" PUMP

Built-in dependability and sensible pricing make the "Bud-Jet" one of the biggest values in the industry. Thousands of installations prove: "You can install the Aermotor 'Bud-Jet' with confidence . . . and PROFIT"!



THE Deep Well PUMP

When the job calls for a working head, install the tried and proved Aermotor Deep Well pump. Adjustable stroke . . . distinctive U-Bar construction . . . positive lubrication. Here's the pump that will stand the test of time!

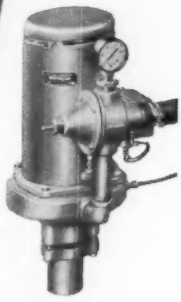


THE Submersible PUMP

Now the Aermotor Submersible's more competitive than ever. New models and motor ratings mean you'll be able to install "half horse" pumps in installations that formerly used "three-quarter horse" pumps . . . and still get top-notch Aermotor performance. Ask your Aermotor representative for all the details.

THE 'VJ' PUMP

More new adapters make the "VJ" the easiest-to-install vertical jet made. You save time and money on every installation AND because "VJ" adapters are directly interchangeable with the "MJ" Multistage your inventory requirements are cut in half!



Sell the Complete Line for '59— AERMOTOR!

99-A

News . . .

(Continued from page 44)

There is positive protection against outside moisture and dirt. The base and strainer are made of high grade

Deming's new submersible sump pump.

cast iron. Float or electrode type controls are available.

Other Deming Demersible sump pump equipment includes single pump float switches; drip-proof switches, totally enclosed switches; alternator float controls; totally enclosed alternators; high water alarms; and magnetic starting equipment.

Officials of the firm point out that the new pump is excellent for installations where high water sometimes covers a regular sump pump, causing it to cease operating in inflicting severe damage to the pump. Being totally submerged under normal operating conditions, the new Deming Demersible Submersible continues to operate and quickly catches up to the quick rise in water level and pumps it down to a safe level again. This is especially true in low areas such as underpasses on highways during cloudbursts.

Deming has produced an informative 8-page bulletin covering the pump. Features of both motor and pump are presented in the bulletin. Materials of construction are outlined in an easy-to-read table. Performance tables, dimension tables, optional equipment, installation data and architect's specifications are all presented.

Schell . . .

(Continued from page 22)

to pump sand. We finally moved our rig, drilled an entirely new 7-in. diameter well and cased it with 5-in. pipe. That well bottomed at 303 feet and the customer is now satisfied with his water supply."

Fishing jobs are one unpleasant facet of water well drilling with which Schell luckily has had little experience. "The only kind of fishing problem I've run into has been an occasional lost tool due to the drill cable pulling out where it's attached at the mandrel," he related. "We've never had to spend any more than several minutes to recover the tools, though."

Like many other drilling contractors, Schell feels that the word-of-mouth advertising which results from doing good work is responsible for the fact that his drills have always been kept busy, with very few minutes being lost because of a lack of work. He does, however, have his business listed in the classified sections of the Terre Haute and neighboring community phone books.

Now for no more money...

MORE WATER WITH HIGHER PRESSURES!

Now from the originators of jet pumps comes the new STAR line... latest triumph of Jacuzzi Bros.' engineering leadership. It's a completely new line including five separate series. Most important—every STAR line pump is MULTI-STAGE to provide more water at higher pressures. What's more, STAR line pumps have fewer parts... new engineering improvements... all at the cost of an ordinary single stage pump!

- **FOR DEEP WELLS** ... self-priming jet systems for lifts to 400 feet.
- **FOR SHALLOW WELLS** ... self-priming jet systems for lifts to 25 feet.
- **SUBMERSIBLE PUMPS,** too ... for 4, 6 & 8 inch diameter wells and larger.

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STAR line **PUMPS & WATER SYSTEMS**

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Jacuzzi Avenue, Richmond, California

CANADIAN FACTORY: Jacuzzi-Universal (Canada) Ltd., Martin Grove Rd. & Rexdale Blvd., Rexdale, Ontario

Discharge Flow . . .

(Continued from page 16)

vise a customer correctly regarding final pump installation.

When really accurate data is to be compiled, pumping tests should cover a period of several days. A little experience, bolstered by extensive pump tests, will show that a pump test of a few hours' duration will lead to difficulties if relied upon for close accuracy, for many wells yield more water at the time they are finished than they do after a few weeks of steady pumping. On the other hand, some bedrock wells improve in yield after prolonged pumping.

No final figure of dynamic pumping level should be established during pumping at any given rate until at least 24 hours have passed. If the level has changed within a 24-hr. period, additional time should be given to that test. For these reasons the bailer test is inadequate for anything but broad approximation of yield and is unreliable for permanent data.

Water levels may easily be determined by the use of simple equipment. In wells where there is plenty of room between the pump column and well casing, and where the water level remains relatively high, a 4-ft. x ½-in. x ½-in. piece of wood on a cord can be used to take the measurement.

For deep wells another method is generally employed, the cord and stick method being impractical because of the tendency of the cord to wrap around the pump column.

Use Hand Pump

In deep-well measurement, a copper tube ⅛ or ¼-in. in diameter is straightened and lowered into the hole to a point well below the anticipated pumping level. The exact vertical distance from the end of the open-end tube to the center of the gauge should be accurately determined. Because the tube may wrap itself around the pump column while it is being installed, the distance measured on the tube may not be the vertical distance to the water level. Therefore, the best method for installing the tube is to fasten it to the pump column as it is being put into place. The lower end of the tube is left open and its upper end is connected to a gauge, either an altitude or pressure type, then to a shut-off valve hooked up to an ordinary bicycle hand pump.

After the tube is in, water in the line is forced out by pressure from the bicycle pump, the valve between pump and gauge is quickly shut off and the reading on the gauge is noted.

(Continued on page 58)

VON RUDEN **Hydra-Flex**
PORTABLE DERRICK

Hydra-Flex Hydraulic Motor drives heavy-duty, clutch-equipped 3 ton winch with hydraulic-smooth engagement and release. Pull varies with boom angle . . . ton and a half at 60 degree boom elevation. Boom easily raised or lowered for inside tower or inside building work. hydraulically handled for transport or any boom position.

Write for complete information

Distributor Inquiries Invited

HYDRA-FLEX, INC. CLAREMONT 1, MINNESOTA

Measurement of Pump Discharge Flow

TABLE 4
APPROXIMATE FLOWS FROM FULL-RUNNING PIPES
(In Gallons per Minute)

Diameter of Pipe	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"
2"	41	48	55	61	68	75	82	89	96	102
3"	90	105	120	135	150	165	180	195	210	225
4"	150	181	207	232	258	284	310	336	361	387
6"	352	410	470	528	587	645	705	762	821	880
8"	610	712	813	915	1017	1119	1221	1322	1425	1527
10"	960	1120	1280	1440	1600	1760	1920	2080	2240	2400
12"	1378	1607	1835	2032	2286	2521	2760	2980	3210	3430

Courtesy Edw. E. Johnson, Inc.

BARGAIN *counter*

All advertising in this section is payable in advance. Enclose your check or money order with copy. Rate: $1.00 per line. Minimum charge $4.00. No discounts; no commissions. Count your own copy to avoid delay. The average line contains 28 characters (20 characters if all capital letters are used). Count spaces and punctuation as one character each. Allow 10 characters for box number if blind advertisement is desired. Closing date — 5th of preceding month. Example — January issue closes December 5th. Be sure to address separate inquiries to each advertiser by using the correct box numbers. Mail Box inquiries care of THE DRILLER, South Milwaukee, Wis.

DRILLS FOR SALE

20-W drill, #115147, 1956, truck-mounted, casing reel, spooling device, catheads, cable, 4" tools, very good condition.

22-W drill, #93310, 1952, truck-mounted, casing reel, spooling device, catheads, cable, 6" tools, very good condition.

22-W drill, #105354, 1953, truck-mounted, casing reel, catheads, cable, 6" tools, very good condition.

21-W drill, #69286, truck-mounted, U-2 power, catheads, cable, clean condition.

55 Speed Star, 1958, catheads, casing reel, spooling device, just "broken in".

24-W, trailer-mounted, catheads, casing reel, new shock, new bearings, repainted.

For further information on above machines contact R. R. Howell Co., 31st Ave. & 4th St. S.E., Minneapolis 14, Minn., FR 1-1301.

22-W Bucyrus-Erie drilling machine purchased in 1954, serial No. 110932, mounted on a 1950 Ford truck, complete with catheads, electric starting equipment, catwalks around machine, cables, etc. Truck and machine in good condition. Hoeg & Ames, Inc., Lincoln, Iowa, Phone GRanite 3-2707.

31 Stone, 1955 model, in good condition, on good Chevrolet with 2-speed axle, excellent rubber. All tools. Prentice Sewell, Rt. 2, Versailles, Ky.

DRILLS FOR SALE

Complete well drilling outfit. May be seen at our warehouse in Batavia. Subject to prior sale. Consists of the following:

1—Bucyrus-Erie 21-W well drill. Serial #71633, mounted on 1946 Dodge 1½-ton truck having dual rear wheels. With drill line and sand line.

1—Chevrolet 1953 one-ton service truck. Has flat bed platform and dual rear wheels. Equipped with winch and boom, and large pipe vise.

1—Black & Decker 105 Type E electric hammer.

1—Kohler electric generator, 1,500 watts, 115 volt.

1—3" OD x 14' x 2¼" API drill stem.

1—3¼" OD x 2¼" API swivel wire rope socket.

1—4" x 100# x 2¼" API drill bit.

1—5" x 135# x 2¼" API drill bit.

1—5" x 135# x 2⅝" API drill bit.

1—3" OD x 14' dart valve bailer.

1—pair 2¼" square light pattern drive clamps.

1—pair 2¼" square claw end tool wrenches.

1—No. 1 bar & chain tightener.

1—5" x ⅝" slotted pipe pulling head.

1—No kink wire rope saver for 2" neck.

1—300 Clayton Mark pump jack outfit complete with ½-hp Wagner motor. Asking $3,900 for all equipment listed above, as is, FOB Batavia, Ill. All in good condition. Larson-Becker Co., Batavia, Ill.

1—1-W 1957 model mounted on a 1957 International truck with dual wheels. It is a 1-ton truck. The machine is complete with lines and has utility boxes mounted on the sides. Machine & truck are like new. For further information please contact Clifton Pitman of Wentzville, Mo. or R. R. Long Co., RR #1, Mound Rd., Jacksonville, Ill. Phone CHestnut 5-2613.

Mayhew 1000 rotary mounted on 1951 Ford V8 truck, Gardner Denver pump, 600' drill stem, $7,000. Andrew Organek, So. St., Suffield, Conn.

One Longyear diamond core drill, Jeep mounted, 24" stroke, complete with tools. Drill and jeep are in excellent condition. Used less than 100 hours. Contact: Maurice Weaver, Dover, Ohio, Phone 4-2391.

DRILLS FOR SALE

1—1954 60-L, trailer-mounted. It has a full set of cables, tackle strut, tool crane, with cable, casing reel, spooling device and power derrick hoist.

1—24-L, trailer-mounted, a very good machine.

1—21-W, truck-mounted. A very clean machine in good condition.

1—1954, 20-W mounted on a very good 1946 Ford truck. It has a full set of cables, casing reel, spooling device, power derrick hoist and full electric starter. Both the truck and drill motors have been recently overhauled. The machine is in very good shape.

1—1954 22-W, truck-mounted, with casing reel, spooling device, power derrick hoist and full starter. In very good condition.

1—1950 22-W, mounted on a very good F-6 Ford truck, 1948 model, it has casing reel, spooling device, power derrick hoist and full electric starter. This machine has just been gone over and is in A-1 condition.

1—Used bull reel brake housing for 24-L.

1—Used tool guide, like new for 28-L.

For further information, contact R. R. Long Co., RR #1, Mound Rd., Jacksonville, Ill. Phone: CHestnut 5-2613.

WIDOW MUST SACRIFICE—Dunlap reverse circulation water well rig, semi-trailer mounted, 35' tower, 15' Kelly, 6" displacement, welder, light plant, 332' drill stem, bits, complete set tools. Top condition. Appraised at $16,000, complete. Someone please offer $11,000, as I MUST sell. Virginia Thompson, 5415 E. Osborn Rd., Phoenix, Ariz. Phone: WH5-0252.

Star 71, complete, water truck, welder, $3,750.

Failing 1500 long mast and kelly. Fred Butler, Box 481, Pueblo, Colo.

#40 — 52 Cyclone mounted on 42 Dodge truck. $2,000. George Neiman, Jr., 32168 Carlisle, Wayne, Mich.

1—1-W, 1957 model, just like new, complete with lines and mounted on a late model Dodge truck. For further information contact L. J. Kessler of Troy, Mo., or R. R. Long Co., RR #1, Mound Rd., Jacksonville, Ill., Phone CHestnut 5-2613.

DRILLS FOR SALE

Trailer mounted rope type drill — old but dependable. $200. Tools, bailers, wrenches, cable jars — $225. A. Lucas, Glencoe, Ill. VE 5-1640.

2—50 Keystone well drills, 1948 and 1955 models, mounted on 6x6 Army trucks, all in excellent condition. Also bits, stems, bailers, fishing tools are to be sold. Columbia Pump & Well Co., 318 Rittenhouse St., N.W., Washington 11, D.C. Phone RAndolph 3-3658.

1—22-W, #113502, with Hercules engine, rubber sheaves, spooling device, casing reel, fan blower, starter, mounted on 1947 Mack truck.

1—20-W, #112460, with Hercules engine, tool guide, casing reel, fan blower, starter, mounted on 1946-47 GMC truck. Hickory Well Supply Co., P.O. Box 602, Hickory, N. C.

Failing 750, hydraulic, with 250 ft. drill stem, mounted on heavy-duty Chevrolet truck—all in first class shape. Price $5,000. J. H. Woodman, Shelton, Neb.

2—Joy 58BH rotary blast hole drills. 440 volt, 3 ph., 60 cycle electrical equipment. Both machines bought new, 1951. Tools and spare parts available. The Driller, Box 761, So. Milw., Wis.

New Model 71 Star drill, mounted on new cab and chassis, complete with 700 ft. of new cables, new tool string, and everything else right down to forge equip., jacks and blocking, etc. The only thing needed to get started in business is a pair of gloves. Truly an unusual opportunity. Contact Bush Well Drilling, Stroudsburg, Pa. Phone 3690.

1 combination rotary and bucket auger, hyd. hoist on mast, 21′ square 100′ threaded rotary rod bucket for 24″ hole. On '51 Ford, 2 speed. W. L. Rulon, Hereford, S.D.

1952 model 42 Cyclone, complete with all tools. Mounted on International truck. Willard Verbitsky, Pottsville, Pa., Phone MA 2-6371.

22-W Bucyrus-Erie, new in 1956. Equipped with casing reel, tool guide, spooling device, blower, power derrick, rubber cushion sheaves, electric starting, complete set of tools and lines, both 6 and 8″. Extra small tools included. Mounted on 1952 Dodge truck, both in very good condition, now working. Complete $5,700. Lundie Well Drilling Co., 205 Silver St., Bridgeport, Conn. Edison 9-5878.

MISCELLANEOUS FOR SALE

New Fords at wholesale! Pickups only $1625, full delivered price, McClure Motor Co., Inc., El Dorado, Kansas.

Army surplus well drilling and pumping items. Peerless Hi-Lift Stators, $25 ea., pp. Hand tools, pumps, belts. Write J. B. Reed, Fredericktown, Ohio.

Drilling tools, one Burns socket, one 4″x14′ drill stem, two 200# 6″ bits, 2 x 3 API joints, pair 3¼″ drill wrenches, drive clamps and rope saver. Also two Blackhawk Hi-Lift 20-ton jacks. Priced reasonable. C. L. Schuler, 702 Harris St., Normal, Ill. Phone 8-8705.

New pipe casing in stock: 3″, 4″, 6″, 8″, 10″, 12″. Reconditioned pipe casing in stock: 3″, 4″, 4½″, 5″, 6″, 8″, 10″, 12″. Cutting and threading facilities; attractive prices on request. H. Schwartz & Sons, 2235 N. Bodine St., Phila., Pa., GArfield 6-6464.

New and used pipe and casing. Also used well drilling rigs. Tom's Well Driller Supplies, 1225 Lancaster Ave., Reading, Pa. Phone SPruce 7-6331.

500′ pocket size water level indicator, complete, ready to use, with one extra spud. Price: $21 post paid. C. W. Lutts, 705 Plaza Serena, Ontario, Calif.

1 Model TD-6 International tractor-dozer-shovel with Bucyrus-Erie front end loader. Serial #50345. Contact Mr. Joe Mesalam, Alexandria, Ind. Price $1,500.

WELL BUSINESS FOR SALE

Well drilling rig and pump business. Several wells already contracted for at $10 per foot, sold with rig. Time payment with backer. Phone Chestertown, N.Y. 2442.

WELL BUSINESS FOR SALE

Well driller and plumber for 30 years, now retired. Have good motel business on the same premises for sale. Territory also calls for a lot of well drilling and plumbing. Located in town, Route 52, state highway, Loch Sheldrake, N. Y. Phone HUrleyville 369-M (Little cash required.) Nick Kiriakou, P.O. Box 25, Loch Sheldrake, N. Y.

EQUIPMENT WANTED

Used Bucyrus-Erie 22-W on 2-ton truck, with or without tools. Felix Montes, 8a. Calle #3-27 Z. 1, Guatemala, Central America.

HELP WANTED

Representatives: A new marketing program — nothing like it in the industry—makes this an opportunity for highest earnings in the sale of plastic pipe to all brackets of the water service market—dealers, well drillers, wholesalers! Manufacturer has large self-contained factory for the extrusion of plastic pipe of all types. Top commissions and full factory support. If you are interested in selling a full and quality line with a near century-old company—wire Box 762 this magazine for full information. All replies will be acknowledged.

Wanted: Water well driller, at once, to drill 6″ and 8″ wells with 20-W Bucyrus-Erie machine. Patrick Porter. 2300 No. 5th St., Clinton, Iowa.

POSITION WANTED

Have years of experience both domestic and irrigation wells and pumps. Would like to locate with reliable firm, on sales. P. O. Box 658, Greenfield, Calif.

When writing advertisers,

please say you saw it

in *THE DRILLER*

Discharge Flow . . .

(Continued from page 54)

This reading represents the total number of feet or pounds of pressure required to counterbalance the depth of the water standing outside the air line. If the reading is in pounds pressure, it may be converted to feet by multiplying by 2.31 and subtracting the product from the vertical distance between the gauge and the end of the air line. This result will be the exact distance in feet to the water level in the well, whether that level is static or dynamic. If the reading is in feet on an altitude gauge, the water level in the well is determined by simply subtracting the reading from the vertical distance of the air line.

Another method for determining water levels in a well is by the use of an electric sounder. One such device consists of an insulated wire connected to a battery or magneto through a light bulb. As soon as the sounder reaches water, a circuit is made and the bulb lights.

For compiling a curve to determine the pumping characteristics of a well, pumping should be started at a relatively low rate of discharge over a sufficient length of time to establish constants of discharge and level. After the first figure has been determined, pumping should be increased and held at a higher rate for a given length of time during which the level is closely watched for variation. After several periodic increases have been made, a curve may be plotted to indicate the capacity of the well. It should be remembered, however, that when the water column in the well has been pumped down by 50%, about 75% of the well's capacity is being pumped.

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"This flexible pipe helps us give quicker service at lower cost"

says California well driller

"We can give quicker service at lower cost using pipe of ALATHON 25," says Robert Crow of Stockton, California. "And we find that installing pipe made of ALATHON saves us the trouble of hauling special pulleys, ropes and other equipment. One man can uncoil this pipe and put it in place. We can assure our customers there will be no breakdown from electrolysis or corrosion. And pipe of ALATHON 25 will not rust or give taste and odor to the water."

Now available to drillers is pipe made of ALATHON Super 25 polyethylene resin, an improved form of ALATHON 25. A product of constant research in the Du Pont laboratories, ALATHON Super 25 makes the most durable, flexible pipe available. Insist on the pipe with the green tag and the words—"Quality Pipe Made of Du Pont ALATHON Super 25".

ALATHON Super 25

ALATHON *is the registered trademark for Du Pont's polyethylene resins.*

DU PONT

REG. U.S. PAT. OFF.

Du Pont does not manufacture pipe, but supplies ALATHON® SUPER 25 polyethylene resin to leading pipe extruders.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

This 6-year-old, 286-lb. African lioness kept right on top of everything at the International Petroleum Exposition, held May 14-23 at Tulsa, Okla. "Blondie" — full-grown pet of Charles E. Hipp, veteran drilling contractor and oilman from Graham, Texas — gets a "cat's-eyeful" of Bucyrus-Erie drill exhibit from atop the main machinery of 120-SL mobile well servicing machine, introduced by the manufacturer at show.

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